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ABSTRACT

Two experiments conducted at the University of Texas at Austin are discussed in this paper. One experiment deals with the production of final syllable lengthening and stress in Spanish and English by native Spanish speakers learning English. The other experiment deals with judgments about the Spanish speakers' production of English by native English speakers. In the former experiment, duration and frequency are measured. From these measurements, final syllable lengthening and duration and frequency ratios between stressed and unstressed syllables are calculated. In the latter experiment, the Spanish speakers are ranked according to their overall English pronunciation ability as perceived by native English speakers. Explanations are given for the durational and frequency adjustments the subjects make from Spanish to English, and the implications of the experimental results for English training programs for Spanish speakers are discussed. (Author/PMP)

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The Learning of English Suprasegmental Rules for Stress and Final Syllables by Spanish Speakers.[1]

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University of Texas at Austin

Introduction

Languages tend to have, in their production, a set of temporal regularities which suggest a set of dynamic rules as properties of the production mechanism. These rules will vary from language to language. The question investigated in this paper is whether certain aspects of the dynamic rules for Spanish predispose native speakers of Spanish towards particular patterns of learned English. The particular set of durational rules considered are those dealing with segment duration in relation to position-in-utterance and stress. In addition, fundamental frequency is considered in relation to stress in order to give a more complete description of stress than would be possible if only a durational parameter were discussed.

Previous studies in phonetics[2] have suggested two suprasegmental durational regularities for vowels in English:

1. a durational ratio between stressed and unstressed syllables of approximately 1.6 and
2. a tendency for final syllables to be longer than non-final syllables[3] of like stress by about 100 msec.

and for vowels in Spanish:

1. a durational ratio between stressed and unstressed syllables of approximately 1.3 and
2. a tendency for final syllables to be longer than non-final syllables of like stress by about 30 msec.

A durational ratio between stressed and unstressed syllables, henceforth called Stress Duration Ratio, refers to the divergence between stressed and unstressed vowels. For example, if the stressed vowels for an English speaker, when averaged, are 150 msec. long and his unstressed vowels, when averaged, are 100 msec. long, his stressed vowels would be half again as long as his unstressed ones. A ratio of 150/100 = 1.50, expressing this fact would be his Stress Duration Ratio.

A durational difference between final syllables and non-final syllables, henceforth called Final Syllable Lengthening, refers to the tendency for final vowels to be longer than non-final vowels of like stress in Spanish and English. For example, an English speaker whose final unstressed vowels, when averaged, are 150 msec. long and whose non-final unstressed vowels, when averaged, are 50 msec. long, would have a difference between final and non-final unstressed vowels of about 100 msec. This difference is identified here as Final Syllable Lengthening.

Spanish speakers learning English need to learn control of its durational regularities. This study is an investigation of the acquisition of these durational aspects of English by Spanish speakers with

particular emphasis on two questions:

1. What is the relation between the English durational characteristics that the subjects achieve and the previous durational values for their Spanish?
2. What is the extent to which English listeners' judgments of the subjects' English pronunciation ability are related to the subjects' durational rules for English stress and final syllables?

An underlying objective of this study was to work towards the development of optimal procedures for training future speakers of English by considering the differences in the durational rules for Spanish and English and the implications of these differences for the training of Spanish speakers who are learning English.

Two experiments are discussed in this paper. One experiment deals with the production of final syllable lengthening and stress in Spanish and English by Spanish speakers learning English. The other experiment deals with judgments about the Spanish speakers' production of English by native English speakers. In the former experiment, duration and frequency are measured. From these measurements, final syllable lengthening and duration and frequency ratios between stressed and unstressed syllables are calculated. In the latter experiment, the Spanish speakers are ranked according to their overall English pronunciation ability as perceived by native English speakers. Explanations are given for the durational and frequency adjustments the subjects make from Spanish to English, and the implications of the experimental results for English training programs for Spanish speakers are discussed.

Methods

Production:

The native Spanish speakers in the study were ten college-aged males who were from various Central and South American countries and who were roughly comparable in age, educational background and initial English language ability. Their production of Spanish was evaluated at the start of a six-month Intensive English training program at the University of Texas at Austin. Their production of English and the judgments of native English speakers regarding that production were evaluated at the end of their training period. Their Intensive English training was based on the Robert Lado and Charles Fries Michigan Series for Spanish speakers, but it included no emphasis on suprasegmental durational aspects of English as such.

Their initial Spanish was studied by evaluating their production of a set of nonsense words of the form [sás], [sásas], [sasás], etc. placed in terminal position in a Spanish carrier phrase. These words ranged from one to five syllables in length with all possible primary-stress patterns accounted for. Thus, there were two words which were two syllables long, [sásas] and [sasás], one with primary stress on the first syllable and one with primary stress on the second syllable.

There were three words which were three syllables long, [sásasas], [sasásas], and [sasasás], each one having primary stress on a different syllable. The pattern was the same for the sets of four and five syllable words. In all cases, the final syllable was a closed syllable. For English, nonsense words of the form [báb] were elicited in a format similar to the Spanish one.[4]

To help the subjects pronounce the nonsense words with the proper stress, they were asked to use a real language word terminating the carrier phrase before saying the carrier phrase with the nonsense word in it. The following is an example of a subjects' recording:

Say the word contrive. Say the word [babáb].

At least four samples of each utterance (containing a nonsense word) per language were obtained from each subject during a recording session, and the order of the inventory was randomized. There were about forty observations used in calculating the Stress Duration Ratios, the Stress Frequency Ratios, and the Final Syllable Lengthening results.

Tape recordings of the subjects' production were fed into a PDP-12 computer. The vowel durations were measured from an oscillographic trace of the utterance displayed by the computer. The resolution of the display was .25 msec. Vowel frequencies were measured by placing a vertical marker on each of five contiguous glottal pulses.

Perception:

Listeners' judgments of the English Pronunciation of the subjects were evaluated by comparing the production of a particular phrase by a given subject with the production of that same phrase by each of the other subjects. The utterance used was: "Say the word inhibitory." As there were ten such utterances, one for each subject, there were forty-five pairs to consider. The pairs were recorded with each pair separated from the next by five seconds. Each member of a pair was separated from the other member by two seconds. The native English speakers were asked to choose the better speaker of English for each pair to which they listened and not to omit any pair even if it was difficult to make a choice. The twelve subjects asked to make these judgments were students at the University of Texas at Austin.

Results

Production:

Figures 1, 2, and 5 show the results of the initial Spanish production of Final Syllable Lengthening and the Stress Duration, and Frequency ratios of the ten subjects. (See next page.)

Figure 1 shows the amounts of Final Syllable Lengthening for stressed and unstressed syllables in Spanish. The s and u letters between the subject numbers and the figure itself stand for stressed and unstressed. Subject 4, for example, has 76 msec. of Final Syllable Lengthening in stressed syllables, and 11 msec. of Final Syllable Lengthening in unstressed syllables.

Figure 1. A Comparison of Final Syllable Lengthening in Stressed and Unstressed Syllables for Spanish - ten subjects.

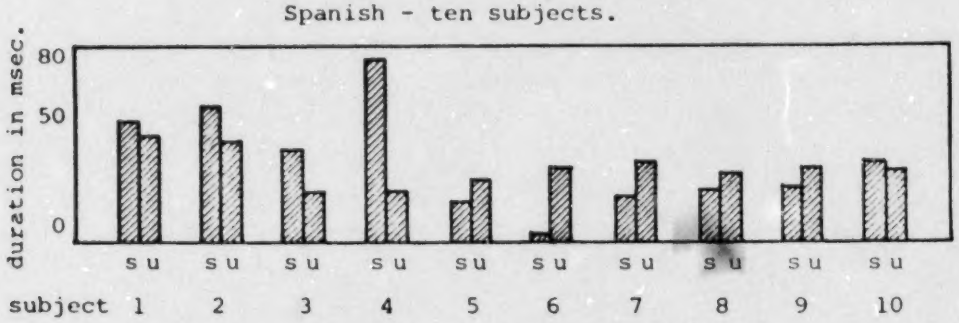


Figure 2. Stress to Unstress Ratios for Spanish - ten subjects. Duration.

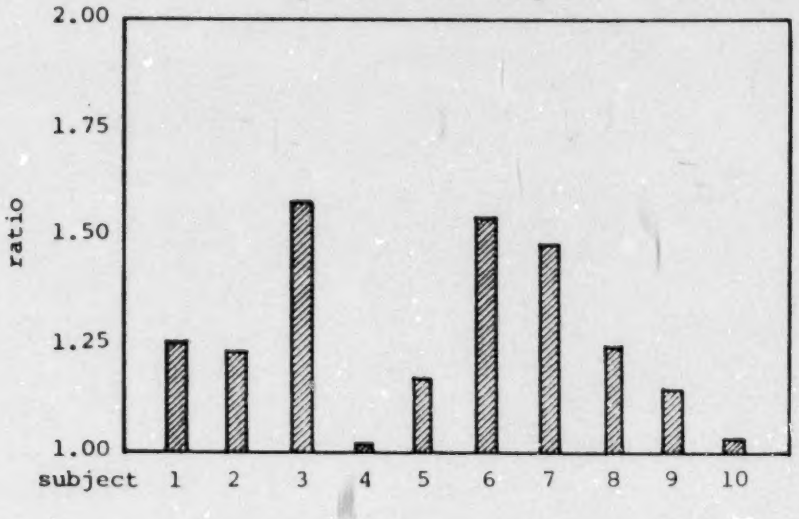
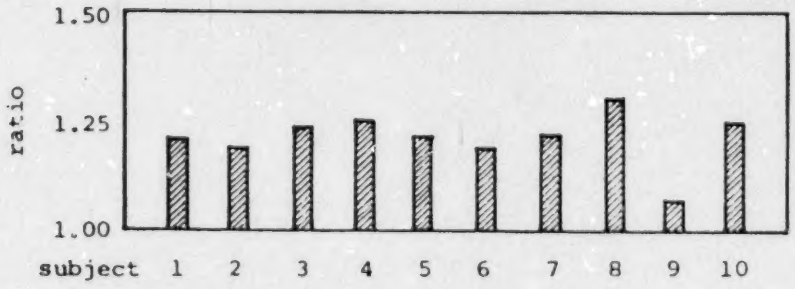


Figure 5. Stress to Unstress Ratios for Spanish - ten subjects. Frequency.



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Only Subjects 1 and 2 lengthened both stressed and unstressed syllables by more than 20 msec., which can be compared with the 100 msec. figure cited previously as being typical for English syllables of both types. Apart from these two subjects, Subjects 3 and 4 show considerabble lengthening for stressed syllables but no other subject shows much lengthening in either condition.

Figure 2 shows the Stress Duration Ratios in Spanish. All of the subjects' stressed syllables are longer than their unstressed syllables but there is a considerable range of Stress Duration ratios -- from 1.01 for Subject 4 to 1.58 for Subject 3. Subjects 3, 6, and 7 have large ratios averaging about 1-1/2, which is close to the average English value cited earlier. But the average Stress Duration ratio for the whole group is 1-1/4. There does not seem to be a straightforward relation between Final Syllable Lengthening and the Stress Duration ratios across subjects.

Figure 5 shows the Stress Frequency ratios in Spanish. All of the subjects' stressed syllables have higher pitch than their unstressed syllables, and the range is relatively narrow: from 1.13 for Subject 9 to 1.31 for Subject 8. The average Stress Frequency ratio for the whole group is about 1-1/4.

Figures 3, 4, and 6, on the next page, show the results of the English production of Final Syllable Lengthening and the Stress Duration and Stress Frequency ratios superimposed on the results of the initial Spanish production (indicated by hash marks) discussed previously.

Figure 3 shows the amount of Final Syllable Lengthening for stressed and unstressed syllables in English superimposed on the Spanish values from Figure 1.

The two subjects who had Final Syllable Lengthening of both stressed and unstressed syllables in Spanish, namely Subjects 1 and 2, increased their Final Syllable Lengthening of both syllable types in English. No other subjects show appreciable Final Syllable Lengthening in their unstressed syllables in English, although a few show increases in their stressed syllables.

Figure 4 shows the Stress Duration ratios for English, again superimposed on the Spanish values shown in Figure 2. Three subjects -- Subjects 1, 2, and 7 -- show a considerably greater increase in their Stress Durational ratios in English than the other subjects. Two of these -- Subjects 1 and 2 -- are the two who most closely approach the Final Syllable Lengthening behavior cited for English.

Figure 6 shows the English Stress Frequency ratios superimposed on the Spanish values shown in Figure 5. All but one subject show some decrease in their ratio. Subjects 1, 2, and 7 show the greatest decrease in their Stress Frequency ratios in English when compared to their Spanish Stress Frequency ratios. The average Stress Frequency ratio for the group is about 1.15.

Perception:

To see how these aspects of English durations relate to listeners' judgments of the pronunciation of English, consider the results of

Figure 3. A Comparison of Final Syllable Lengthening in Stressed and Unstressed Syllables for Spanish and English - ten subjects.

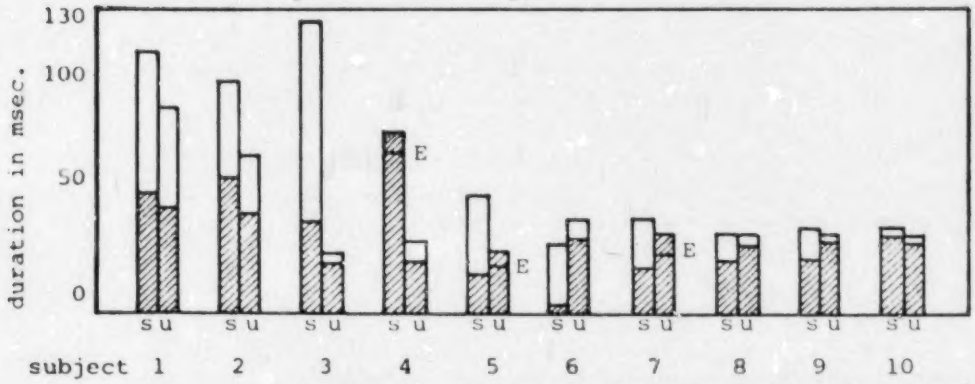


Figure 4. Stress to Unstress Ratios for Spanish and English - ten subjects. Duration.

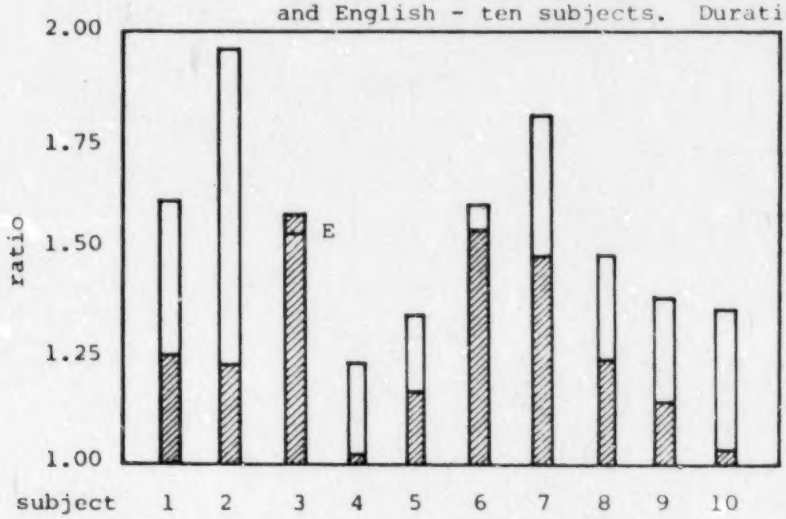
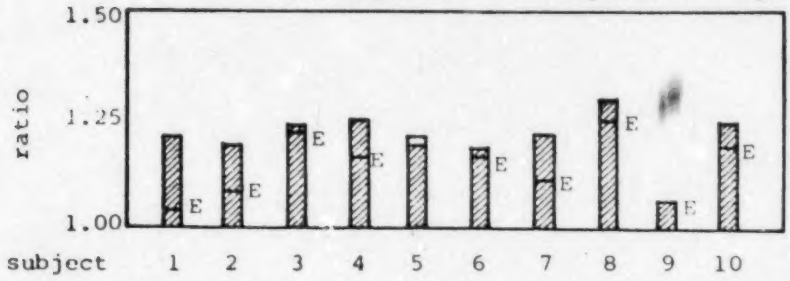


Figure 6. Stress to Unstress Ratios for Spanish and English - ten subjects. Frequency.



the Paired Comparison test which can be found in Table 1.

Table 1. Paired Comparison Test Results.

Subject	Number of Times Subject Was Preferred	Rank
1	103	1
2	70	2
6	62	3
3	60	4
7	52	5
8	45	6
10	43	7
5	42	8
9	39	9
4	24	10

Of the subjects who improved their Stress Duration ratios most, i.e. Subjects 1, 2, and 7, Subjects 1 and 2, who approximated Final Syllable Lengthening in English most closely, are ranked first and second. Subject 7 is ranked fifth and the remaining ranks are rather closely related to the English Stress Duration ratios of the rest of the subjects.

Discussion and Conclusions

Production:

It can be seen from these results that the whole group progressed toward approximating English durational stress-to-unstress ratios. This progress could be a result of the fact that even the teacher least interested in pronunciation will make some effort to encourage students to stress words correctly. However, it is likely that the teacher is correcting stress placement rather than stress production, in which case the student's production of stress depends on the way in which the student perceives the teacher's production of stress.

What is interesting is that the emphasis on "correct" stress did not carry over to lengthening syllables in utterance final position. The reason for this may be that the technique which is used in stressing a syllable is unsuitable for making utterance final syllables long.

Stress is signaled by as many as four acoustic parameters: duration, frequency, intensity, and vowel quality. It is not clear what role any one parameter within the complex of acoustic parameters that cue stress might play in relation to the way a Spanish speaker perceives and produces stress in Spanish -- and in relation to the way in which an English speaker perceives and produces stress in English. There probably are cross language differences in the perception of the several acoustic parameters in stress and, therefore, one is not in a position to know exactly how the Spanish speakers interpreted the "correct" stress example given by the teacher regarding stress formation.

One might imagine, in the absence of any more information, that the teacher's example for "correct" stress was interpreted by the students as a command to add more of each of the acoustic parameters they normally use to signal stress to the English stress situation. If this were so, it would be unlikely that a subject would notice or implement duration in utterance final position because utterance final position is normally an environment in which there is a decrease in energy, i.e. acoustic parameters, rather than an increase.

However, the Stress Duration and Stress Frequency ratios indicate that the teacher's "correct" stress example was not interpreted as a one-to-one "more-of-each-of-the-acoustic-parameters-you-normally-use-to-signal-stress" command. The subjects did increase their duration ratio from Spanish to English but they decreased their frequency ratio.

It may be that the "more-of-each-acoustic-parameter-you-normally-use" interpretation, that is being attributed to the subjects, is much too simplistic an interpretation of what they perceive in the "correct" stress example. Perhaps they properly interpret the "correct" stress example as "use-a-different-complex-of-acoustic-parameters-than-you-normally-use." The fact that in the new stress complex there is more duration than was used in Spanish may be coincidental. What is important is that the new stress complex of parameters (no matter what its internal relationships might be) continues to exhibit more energy than is exhibited in utterance final position.

While the increase in Stress Duration Ratio did not influence the subjects' use of duration in utterance final position, it may be that, in the case of Subjects 1 and 2, having Final Syllable Lengthening rules in Spanish of the same type as those for English may have helped them. Not only did they lengthen final syllables of both types in English, but they handled duration appropriately in English stress as well.

On the other hand, Subject 7, who had no significant amount of syllable lengthening in Spanish and no signficant increase of Final Syllable Lengthening in English, did have a considerable increase in Stress Duration Ratios from Spanish to English. These results suggest that subjects may use different strategies in acquiring the durational rules of a second language.

The stress duration and frequency data call for more investigation into the roles of perception and production of stress in Spanish. If one assumes that a subject is predisposed to learn English stress by the dynamic rules for Spanish stress that he may have, then it becomes necessary to know how important any one acoustic parameter is and what role that parameter has in the subject's perception of stress in Spanish. If this differs from Spanish to English, the subject may have a great deal of difficulty perceiving what that difference is for English, and may not be able to implement the proper increment.

One of the questions that arises from an inspection of the Spanish data is whether the range of individual vairation for final syllable lengthening and for durational stress-to-unstress ratios is conditioned by the subjects' speaking different dialects of Spanish. In the present study, three of the subjects were Colombians, judged to be speaking the

same dialect because they came from the same geographical area in Colombia. Of the three (Subjects 2, 4, and 10), Subject 2 had final syllable lengthening in both stressed and unstressed syllables, and he had a substantial durational stress-to-unstress ratio, in fact, the smallest of the entire group. Subject 10 had the least amount of final syllable lengthening of these three subjects in Spanish, and had a very small durational stress-to-unstress ratio. Each of the three subjects handled the durational regularities, i.e. final syllable lengthening, somewhat differently, although they spoke the same dialect of Spanish. It would seem, then, that the Spanish data reflects a range of individual variation not conditioned by dialect variation.

An extremely interesting finding of this study is that -- after participating in a six-month program of intensive English study which did not emphasize suprasegmental durational cues in English -- eight out of ten subjects did not lengthen their final syllables any differently than they normally lengthened them in Spanish when they arrived.

Clearly, the intensive English training program might be improved, given the importance of suprasegmental duration as indicated in the literature, if specific attention were given to the acquisition of suprasegmental durational regularities in English. Experimentation, using two groups evenly matched as to age, educational background, and beginning English language ability (in which one group would receive durational exercises and the other group would not), might indicate whether asking subjects to focus on and try to control an acoustic parameter like duration is helpful in their acquisition of the appropriate use of that parameter in English.

Perception:

In order to evaluate how closely related the listeners' judgments in the Paired Comparison study were to the English stress-to-unstress ratios, a rank correlation coefficient was calculated. The value obtained, .876, was very high -- beyond the .01 level of significance. This may have been because the stress-to-unstress ratios were, in turn, correlated with the development of other possible factors the listener could have focused on, such as consonant and vowel quality, intensity, and other rules of temporal control. An example of such possible factors is found in the word inhibitory, which was the real language word that terminated the carrier phrase in the Paired Comparison study. There is crucial information about consonant and vowel quality in its stressed syllable in that the h is aspirated and the i is a lax vowel. The two unstressed vowels in the syllables immediately preceding and following hi in "inhibitory" are as important as the stressed vowel. The vowel in the syllable that precedes hi is high, lax, and, importantly, does have primary stress, while the vowel in the syllable that follows hi is the reduced vowel [ə]. The Spanish cognate for inhibitory is inhibitorio, a word in which there is no h, the i is high and tense, and the stress is on the penultimate syllable. Furthermore, the two unstressed vowels in the syllables immediately preceding and following hi are also high and tense. The English vowel sequence in the first three syllables of "inhibitory" is

[ɪ] [ɪ́] [ə], while the same three vowel sequence in the Spanish word "inhibitorio" is [i] [i] [i], all three syllables being unstressed.

If the subjects who achieved the most appropriate stress-to-unstress ratio also achieved the most appropriate segmental quality in the three initial syllable sequence of inhibitory, then the high correlation coefficient may be reflecting more than stress-to-unstress ratio alone. If, on the other hand, no such correlation exists, then the stress-to-unstress ratio would appear to be a correspondingly more powerful cue for listeners in their judgments of English pronunciation ability.

Summary

This study is an investigation of the acquisition of two supra-segmental durational regularities in English by Spanish speakers ... specifically Final Syllable Lengthening and Stress. For the purpose of having a more complete description of the acquisition of stress, fundamental frequency was investigated in addition to duration.

Ten Spanish speakers, who arrived for an intensive English training program, recorded carrier phrases terminated by nonsense words of the form /sás/ for Spanish, and of the form /báb/ for English. The results reported here are those of the initial Spanish recording session and those of the final English session six months later. Vowel durations and frequencies were measured on a PDP-12 computer.

Twelve native English listeners' judgments of the English pronunciation of the Spanish speaking subjects were evaluated. The English listeners were asked to rank the Spanish speaking subjects as to their comparative ability to produce the same real language English sentence.

The results of the nonsense word study showed that Spanish speakers had about 25 msec. of Final Syllable Lengthening in Spanish. This is consistent with the norm cited in the literature. Two of the ten subjects increased their final syllable lengthening in both stressed and unstressed syllables from Spanish to English so as to approximate the English norm cited in the literature. The subjects showed a Stress Duration ratio of 1-1/4 for Spanish which was consistent with the Spanish norm cited, and a Stress Frequency ratio of 1-1/4, for which there was no Spanish norm available.

All of the subjects, except one, increased their Stress Duration ratios, approximating the English Stress Duration ratio. All of the subjects, except one, decreased their Stress Frequency ratio.

These results seem to indicate that the complex of acoustic parameters used in Spanish stress is different from the one used in English stress, and that the subjects did perceive the difference and try to make appropriate adjustments in signaling stress in English. The awareness subjects had for stress did not cause them to be aware of Final Syllable Lengthening, probably because there is less energy in utterance final position than in stressed syllables, and, as such, utterance final position is less prominent. Therefore, the durational difference between Spanish and English in final syllables was not perceived by eight of the ten subjects.

Upon inspection of the Spanish data, it was concluded that the range of individual variation was not conditioned by dialect differences. Another conclusion of the study was that the training program might be improved if increased attention were paid to pronunciation, particularly the acquisition of suprasegmental durational cues. Finally, it was concluded that, while there was a high correlation between the English listeners' judgments in the Paired Comparison study to the durational stress-to-unstress ratios, this was probably reflecting other factors the listeners might have focused on, in particular vowel quality differences between the stressed and unstressed syllables.

NOTES

1. I want to thank the Ford Foundation whose Doctoral Fellowship for Mexican-Americans has supported me during the last two and one-half years. I also want to thank Peter MacNeilage for his considerable help throughout this project.

2. The two studies from which these figures are taken are the DeLattre and the Oller studies listed in the bibliography.

3. The words "lengthening", "long", "longer", etc. are used descriptively throughout this treatment. There is no implication that there is some optimal or standard vowel duration and that vowels in some positions are lengthened in relation to some optimal vowel duration.

4. Syllables of the form [sás] were chosen for Spanish, rather than syllables of the form [báb] because voiced stop consonants are spirantized intervocalically in Spanish and would, presumably, cause intrinsic lengthening of vowels in medial positions. Furthermore, segmentation using a voiceless strident fricative, rather than a voiced non-strident fricative, would be clearer, and, therefore, easier to determine. Syllables of the form [báb] were chosen for English in order to compare the results with Oller's findings for native English speakers.

BIBLIOGRAPHY

Delattre, Pierre. "A Comparison of Syllable Length Conditioning Among Languages." International Review of Applied Linguistics, Vol. VI, 3, pp. 183-198.

Oller, David. The Duration of Speech Segments: The Effects of Position-in-Utterance and Word Length. University of Texas at Austin, Unpublished Ph.D. Dissertation, 1971.

papers

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